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# CURRENT ISSUES IN HYDROLOGICAL TERMINOLOGY AND THE CLASSIFICATION OF WATER BODIES IN THE CONTEXT OF UKRAINE'S WATER LEGISLATION

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***Abstract.*** *As a result of the analysis of legal issues arising in the implementation of the provisions of the Water Code of Ukraine concerning the protection regime of water fund lands, it has been established that these issues are largely caused by the ambiguity of hydrological terminology and the absence of statutory definitions for certain hydrological terms used in, or omitted from, the Water Code. In particular, this includes such terms as "river", "small watercourse", "stream", "low-water period", "slope gradient", "lagoon", "river estuary", etc. The application of the linear approach to determining the outer boundary of waterside protection zones requires the establishment of fixed reference values for their width and for slope gradient. However, the low-water level, which under the Water Code serves as the inner boundary of waterside protection zones, is not a constant value and may vary considerably both from year to year and during the same low-water period. Furthermore, establishing its long-term mean value is practically impossible in the places where long-term hydrological monitoring data for rivers are unavailable. Another reason for legal problems in establishing the boundaries of waterside protection zones is the absence in the Water Code of a classification of natural and artificial water bodies, in particular, the lower limit of the catchment area of small rivers, as well as the area or depth of lakes and ponds. Based on the conducted research, amendments to the statutory river classification of the Water Code have been proposed, along with a classification of lakes according to their water surface area. These proposals would provide a differentiated approach to determining the width of waterside protection zones for specific categories of small watercourses and water bodies. Proposals have been made for changes and additions to the glossary of hydrological terminology given in the Water Code of Ukraine. For the practical implementation of new methodological approaches to determining the boundaries of waterside protection zones, it has been proposed to develop separate regulatory and methodological recommendations that would take into account the peculiarities of the hydrological regime of the river and the morphology of the riverbed.*

***Keywords:*** *river, water body, lake, pond, low-water period, lagoon, waterside protection zone, Water Code, legislation*

**Relevance.** The main requirements for preserving water resources, ensuring the required water quality, and improving the hydro-morphological state of riverbeds and waterside landscapes are defined by the Water Code of Ukraine (WCU), which provides for the establishment of a regime of limited economic activity on water fund lands located along rivers, seas, and around lakes, reservoirs, and other bodies of water. The lands of the water fund, in particular, include riparian and coastal (further, waterside) protection zones (WPZ), for the determination of which borders in Ukraine, a linear principle has been adopted providing for the establishment of the width of the WPZ within fixed limits, depending on the area of river catchment, the volume of water bodies, and the gradient of adjacent slopes [1]. The provisions of the WCU are mandatory norms [2] and therefore the legislation should establish




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uniform methodological approaches that ensure unambiguous results of determining the width of the WPZ. At the same time, numerous legal actions in recent decades indicate the possibility of ambiguous interpretation of the provisions of the WCU, which is largely due to the ambiguity of the interpretation of hydrological terminology and the lack of regulatory classifications of natural and artificial water bodies according to their hydrographic characteristics. A number of legal inconsistencies in individual provisions of the WCU are due to the lack of a comprehensive, institutionalised classification of water bodies in Ukraine, as well as a glossary that ensures the unambiguity and impartiality of interpretations of hydrological terminology.

**The aim of the research** is to improve the existing hydrological terminology and classification of water bodies to ensure their unambiguous interpretation in the implementation of the requirements of the water legislation of Ukraine.

**Analysis of recent research and publications.** The main regulatory documents with definitions of hydrological terminology in Ukraine are DSTU 3517:2024 [3] and Article 1 of the Water Code of Ukraine [4]. A more extensive list of terms is given in the Hydrological Dictionary [5]. The classification of rivers given in Article 79 of the WCU was adopted on the basis of the Soviet classification based on catchment area, which was reflected in the Soviet state standard GOST 19179-73 "Land Hydrology. Terms and Definitions" published in 1975. Before that, classifications based on river length were more widely used, in particular, the classification of V. M. Rodevych, which, in addition to the categories of small, medium, and large rivers, also included the category of the smallest river (for rivers up to 25 km long). In most countries of the European Union, the classification of rivers based on catchment area is adopted according to the typology given in the EU Water Framework Directive 2000/60/EC (WFD) [6]. This typology, compared to the Ukrainian classification, additionally includes the category of "very large rivers" and differs significantly regarding the boundaries of catchment areas compared to the boundaries adopted for river categories in Ukraine. According to the mentioned typology, small rivers include rivers with a catchment area starting from 10 $km^2$, while in the Ukrainian classification there is no lower limit for river gradation. It should be noted that in connection with the implementation of the provisions of the WFD into Ukrainian legislation, work on auditing rivers in Ukraine according to the criteria of the European Union is already underway [7, 8], in particular, in the process of determining surface water bodies in accordance with the Methodology approved by the Ministry of Ecology and Natural Resources of Ukraine in 2019 [9].

According to WCU, for all lakes, regardless of their parameters, the WPZ width is 100 m, and the WPZ around artificial reservoirs is determined depending on the volume of filling and the category of the river, on which they are built. Their classification depending on morphological parameters is absent in Ukrainian legislation. Generally accepted classifications of lakes, ponds, and reservoirs are also absent in Ukrainian scientific publications, where different authors use individual gradations of morphological parameters of water bodies. Particularly, for the lakes of Ukrainian Polissya L.V. Ilyin proposed a classification that includes 7 categories: from very small (area less than 0.1 $km^2$) to the largest (area more than 20 $km^2$) [10, 11]. For reservoirs and ponds, the most common classifications are the ones of V.K. Khilchevsky and V.V. Greben. The classification of reservoirs includes 6 categories depending on their volume: from small (less than 0.01 $km^3$) to the largest (more than 50 $km^3$) [12]. The classification of ponds includes 5 categories depending on their area: from very small (less than 2 ha) to very large (more than 50 ha) [13].

Outside Ukraine, there is also no unified classification of water bodies, and different countries use individual criteria for their typification [14, 15]. In the countries of the European Union, for lakes, as well as for the rivers, the WFD typology is used, which is based on the average depth (3 categories) and the area of water surface (4 categories). The lower limit of lake area according to the WFD is 0.5 $km^2$ [6]. There is no lower limit for the depth of lakes in the typology. An original approach for water bodies classification, based on simultaneous consideration of the depth and area of water bodies, was proposed in India. The category of water bodies is determined by a coefficient calculated from the ratio of average depth and the square root of water surface area [15].

**Research methodology.** The results of the work were obtained on the basis of an information-analytical research method, which consisted in the analysis of numerous legal actions in Ukraine, which arose as a result of ambiguous interpretations by the parties of conflicts of the normative hydrological terminology and imperfect classification of water bodies. As a result, we formed the proposals and recommendations for their resolution.

**Research results and their discussion.** Article 1 of the Water Code of Ukraine, which defines the principal terms used in this legislative act, does not provide a definition of the term "*river"* itself, nor does it define other watercourses referred to in the Code, including "*streams"* (Articles 3 and 88) and "small *watercourses"* (Articles 87 and 88). According to DSTU 3517:2024 [3], as well as the Hydrological Dictionary [5], a river is a watercourse of **significant** size that is fed by precipitation from its catchment and has a clearly defined riverbed. This definition does not provide a clear answer to the question of what a river is, since it does not indicate from what specific catchment area or length a surface watercourse acquires **significant** dimensions. Based on this definition, permanent and temporary watercourses of insignificant sizes are not rivers, and the threshold geometric parameters of streams and small watercourses, which are referred to in Article 88 of WCU, are absent from the regulatory framework of terms and definitions in Ukraine.

The definition of a stream in DSTU 3517:2024 as "a small permanent or temporary watercourse", as well as the definition in the Handbook [16] as "a small permanent or temporary watercourse formed by the flow of melted snow or rainwater, as well as by the emergence of groundwater to the surface (length – from several hundred metres to several kilometres)", also does not reflect the boundary between a stream and a small river. In addition, in the aforementioned handbook, the terms "stream" and "small watercourse" are listed as synonyms, while according to the WCU they are different terms. DSTU 3517:2024 defines the term "water stream" as "*a water body characterised by the movement of water in the direction of the slope along a depression on the Earth's surface*," that is, it is broader than the term "river" and covers all terrestrial water streams.

According to the Water Code of Ukraine, the classification of the country's rivers provides for their division into three categories, which are determined depending on the catchment area of their basins. The category of small rivers includes all watercourses with a catchment area of up to 2,000 km$^2$, i.e. this category includes both rivers with a length of tens of kilometres and streams or small watercourses. The mentioned classification of rivers does not correspond to the classification of the Water Framework Directive, adopted in the European Union and used to determine surface water bodies also in Ukraine according to Appendix 3 of the Methodology [9]. According to Annex II of the WFD (paragraph 1.2.1, system A), for rivers with a catchment area (S) of up to 2000 km$^2$ ("small rivers", according to the WCU), 3 types of rivers are provided: "small" – S = 10–100 km$^2$; "medium" – S = 100–1000 km$^2$, and, partially, "large" – S = 1000–10000 km$^2$. Accordingly, streams with a catchment area of up to 10 km$^2$ according to the European typology are not classified as rivers, and the categories of "small rivers" according to the WCU correspond to the WFD types of "small" and "medium" rivers, as well as, partially, "large" rivers with catchment areas of 1000 to 2000 km$^2$.

The Catalogue of Rivers of Ukraine [17] and the monographs "Materials on River Typification of the Ukrainian SSR" [18] and "Surface Water Resources of the USSR. Hydrological Knowledge" [19] include all rivers of Ukraine with a length of more than 10 km. The area of rivers with a length of less than 10 km mostly does not exceed 100 km$^2$ and can be classified into the new category of "very small rivers". If the catchment area of a watercourse is less than 10 km$^2$, it can be classified as a "stream" or "small watercourse". Streams should be classified as watercourses that flow exclusively within river floodplains or on the slope of the first above-floodplain terrace. To ensure a uniform approach to the classification of watercourses by catchment area, the term "stream" may be replaced by "small water stream" or "small watercourses", referring to watercourses with a catchment area that does not exceed 0.2 km².

Taking into account the above-mentioned, the following classification of small watercourses in Ukraine is proposed:

– streams are permanent or temporary water streams originating from groundwater springs, flowing within river floodplains and along the slope of the first above-floodplain terrace, that have a catchment area of up to 0.2 km²;

– watercourses are permanent or temporary water streams with a catchment area that does not exceed 10 km², the major part of which is located outside the river floodplain;

– very small rivers are permanent or temporary water streams with a catchment area from 10 km$^2$ to 100 km² ;

– small rivers are permanent or temporary water streams with a catchment area from 100 km$^2$ to 2000 km².

According to Article 88 of the WCU, regardless of size and hydrological regime, for all rivers with a catchment area up to 2,000 km$^2$, the required width of the WPZ is 25 m or 50 m where a slope gradient is more than 3°. Taking into account the proposed classification, it is advisable to revise the gradation of WPZs, specifically by establishing the width of 5 m for streams (small


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water streams), 10 m for watercourses, and 15 m for very small rivers, with these widths doubled where the slope gradient exceeds 3°. The justification of the proposed values of WPZ width for the smallest categories of water streams is based on an analysis of their hydrological role, the intensity of anthropogenic impact, and the actual spatial extent in the landscape. For streams (with the WPZ width of 5 m), which flow predominantly within floodplains or along the slopes of the first above-floodplain terrace, the primary environmental protection function is to preserve their water sources and prevent local sedimentation. A width of 5 m is sufficient to form a natural grass and shrub buffer that stabilises the banks without excessive land extraction. For streams with a catchment area of up to 10 km², increasing the width of the WPZ to 10 m provides the minimum required distance for filtering surface run-off from adjacent arable lands, reducing sediment input, and maintaining microclimatic conditions in the mouth areas. For very small rivers with a catchment area of 10–100 km², the proposed width is a compromise between ecological efficiency, hydro-morphological features, and economic feasibility, as increasing the WPZ to 25 m for this category would result in losses of agricultural land disproportionate to the ecological effect. The proposed gradation is consistent with the practice of the EU countries (Poland, Germany, Czech Republic), where for watercourses with a catchment area of <10 km², the width of buffer strips is usually 5–15 m, depending on the type of land use.

A major challenge in delineating WPZ boundaries is determining the elevation reference point that serves as the starting point for calculating slope gradient. In accordance with Article 88 of the WCU, waterside protection zones shall be established along the banks of rivers and around water bodies, extending from the waterline (during the low-water period), regardless of the characteristics of the riverbank, including its configuration and height. For rivers with a slope gradient over 3°, the width of the WPZ doubles, which is due to the higher speed of run-off and, accordingly, a decrease in the time for infiltration of surface waters and a decrease in the level of their natural purification. The shape of river banks primarily depends on the morphological structure of river valleys (type of river valley [20]), soil rocks from which the bank slope is formed, riverbed processes, intensity of wind and wave phenomena, morphological parameters of the riverbed. When determining the boundaries of WPZs, the most important characteristics of the riverbank are its geometric parameters, particularly the height and width of the upper bank slope above the low-water level, the ratio of which determines the gradient of the riverbank slope. In this context, the width of the upper bank slope is defined as the horizontal distance from the low-water level line to the crest of the riverbank slope, i.e., the line marking a distinct break in the bank profile that separates its lower steep section from the floodplain. The waterside protection zones of rivers (except for rivers with gorge-like valleys, where the riverbank slope gradually transitions into a mountain slope) includes the width of the bank slope above the low-water level, whose gradient is always greater than 3°, as well as part of the floodplain. On rivers with steep banks, the waterside protection zones are located almost entirely within the floodplain; therefore, the provision of the WCU stating that "if the slope gradient exceeds 3°, its width is doubled" is incorrect. A more appropriate formulation is "if the slope of the waterside protection zones exceeds 3°, its width is doubled".

In the lowland rivers of Ukraine, riverbed forms are predominantly parabolic and trough-shaped (Fig. 1), with either steep, cliffy, or landslide-prone banks (Fig. 2), or gently sloping banks (Fig. 3). Less commonly, river sections with gorge-like or weakly developed trough-shaped riverbeds occur (Fig. 4). The latter is mostly observed in small lowland rivers with swampy floodplains, whose riverbeds "disappear" within marshy floodplain areas. Various riverbed types may be present even within short segments of the same river, particularly in meandering rivers. According to the WCU, for all of them, the width of the WPZ is measured from the low-water level line. At the same time, the WCU does not specifically indicate from which elevation reference point the slope gradient should be determined, in particular whether it is from the waterline or from the bank crest. The lack of clarity in interpreting the determination of slope gradient leads to legal disputes that often arise in judicial practice when deciding on the requirement to double the width of the WPZ in cases where slope gradient exceeds 3°. Furthermore, Article 1 of the WCU defines the waterline as the boundary of water along the bank of a water body (the coast-line). The clarification placed in brackets, "the coast-line", introduces additional uncertainty, since according to the hydrological dictionary, the coast-line is the boundary between the land and the water surface of a watercourse or water body, which, due to the continuous variation in the elevation (level) of the water surface, forms a more or less **wide stripe** [4].

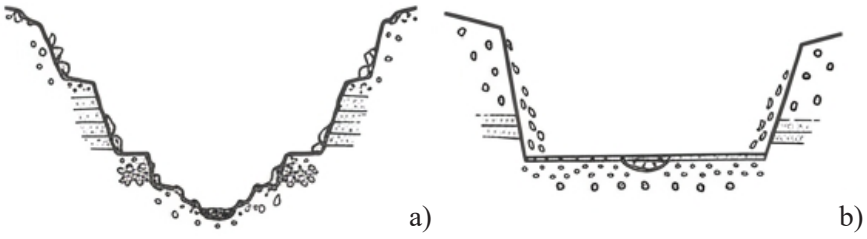


Fig. 1. Riverbeds with a terraced parabolic riverbed (a) and a trough-shaped riverbed (b) [20]

Fig. 2. Steep and landslide-prone banks of the Desna river

Fig. 3. Gently sloping banks of the Desna riverbed


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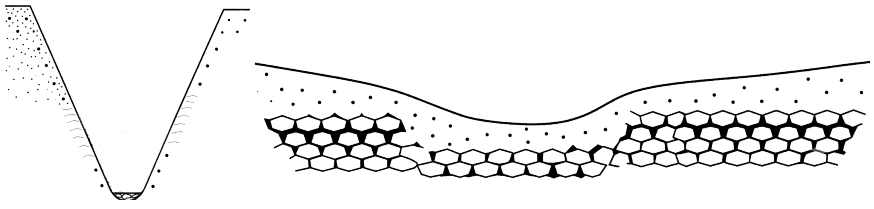

Fig. 4. Gorge-like and weakly expressed trough-shaped riverbed [20]

In practice, in river sections with vertical and steep banks, slope gradient is determined from the coast-line level (without considering the elevation difference between the waterline and the riverbed crest), while in very gently sloping and weakly defined riverbeds it is measured from the waterline. This is entirely logical, since for rivers with steep banks, the distance between the waterline and the bank crest is negligible and therefore has virtually no effect on the width of WPZ. However, in sections with very gently sloping banks, this distance may be of the same order of magnitude as the width of the WPZ. However, such an approach is not legally defined, and parties involved in legal actions, who are interested in doubling the width of WPZ insist on determining slope gradient specifically from the low-water level mark, referring to the WCU. In such cases, on small rivers with a flat floodplain and a steep bank with vertical or very steep slopes, the width of WPZ will be 25 m only if the height of the slope from the waterline to the bank crest is less than 1.31 m; otherwise, when the height of the dry bank slope is greater, the WPZ width should be doubled. For medium-sized rivers, the width of the WPZ under conditions of a horizontal floodplain will be 50 m if the slope height (from the low-water level to the floodplain elevation at a distance of 50 m from the waterline) does not exceed 2.62 m, while for large rivers the WPZ width will be 100 m if the height of the riverbank slope is up to 5.24 m. For higher banks, the width of the WPZ must be doubled. Thus, in river sections with identical floodplain morphological conditions, the WPZ width may differ by a factor of two depending on the bank height. For example, on the section of the Desna river shown in Fig. 2, the width of the WPZ, when slope gradient is measured from the waterline, will be 200 m, of which 197 m corresponds to the floodplain and only about 3 m to the river bank. When slope gradient is measured from the riverbed crest, the width of the WPZ will be twice as small. Another important issue in determining slope gradient is the adoption of a specific scale for detailing the slope micro-relief, as noted in the study [21].

An important term contributing to the ambiguity in delineating WPZ boundaries is the term "low water" (the low-water period). In accordance with Article 1 of the WCU, low water (the low-water period) is defined as the period of the annual cycle during which low flow conditions occur. According to [3] and [5], low water is a phase of a river's hydrological regime that recurs annually in the same seasons and is characterised by low flow, formed as a result of reduced river feeding, which is mainly sustained by groundwater drained by the hydrographic network. The low-water period may be winter and summer-autumn, or only summer. The Water Code does not specify which low-water period should be used when calculating WPZ, although these periods may differ significantly. The issue is caused by the fact that the low-water level is not a constant value. Low-water levels in rivers and water bodies may differ significantly not only between different low-water phases, but also between different months and years within the same phase of the hydrological regime. In particular, the average low-water level of the Desna river at the Chernihiv gauging station during the winter periods of 1996–2010 was 320 cm above the gauge zero, while during the summer–autumn periods it was 206 cm, i.e., 1.16 m lower. For the same period, the amplitude of summer–autumn low-water levels was 152 cm; in particular, the level in 2010 was 125 cm, while in 2006 it was 277 cm (see table 1). The width of the Desna River at the Chernihiv hydrological gauging station is 118 m at the water level of 125 cm, and 145 m at the level of 277 cm, i.e., 27 m wider. In river sections with more gently sloping banks, this difference in width increases significantly.

The determination of the low-water level is particularly problematic for small and medium-sized rivers with a high degree of flow regulation, where, in the downstream sections of ponds and reservoirs, only environmental flow is discharged during low-water periods, which in most cases does not exceed the minimum monthly flow in a year with 95% probability of exceed in the average annual flow. In such cases, the water stream occupies only part of the riverbed, while the unfilled riverbed zone becomes part of the WPZ, according to the WCU (Fig. 5 and 6), thereby reducing its floodplain part.

Average monthly water levels of the Desna river at the Chernihiv gauging station during low-water periods (cm), gauge zero 102.44 m a.s.l. (Baltic System)

| Year | December | Winter low-water period | | | | Summer low-water period | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | December of the previous year | January | February | average | July | August | October | November | average |
| 1996 | 247 | | 267 | 234 | 251 | 178 | 143 | 137 | 173 | 158 |
| 1997 | 306 | 247 | 234 | 233 | 238 | 198 | 183 | 148 | 209 | 185 |
| 1998 | 431 | 306 | 381 | 329 | 339 | 239 | 253 | 259 | 301 | 263 |
| 1999 | 303 | 431 | 426 | 436 | 431 | 210 | 223 | 227 | 242 | 226 |
| 2000 | 338 | 303 | 367 | 378 | 349 | 247 | 273 | 245 | 263 | 257 |
| 2001 | 285 | 338 | 383 | 430 | 384 | 296 | 209 | 200 | 224 | 232 |
| 2002 | 275 | 285 | 299 | 405 | 330 | 153 | 128 | 122 | 218 | 155 |
| 2003 | 285 | 275 | 237 | 245 | 252 | 198 | 192 | 232 | 249 | 218 |
| 2004 | 263 | 285 | 326 | 283 | 298 | 289 | 247 | 182 | 207 | 231 |
| 2005 | 317 | 263 | 331 | 361 | 318 | 363 | 257 | 180 | 181 | 245 |
| 2006 | 362 | 317 | 375 | 316 | 336 | 270 | 219 | 294 | 324 | 277 |
| 2007 | 284 | 362 | 349 | 413 | 375 | 180 | 174 | 158 | 197 | 177 |
| 2008 | 279 | 284 | 304 | 280 | 289 | 202 | 171 | 146 | 173 | 173 |
| 2009 | 273 | 279 | 315 | 357 | 317 | 200 | 161 | 135 | 154 | 163 |
| 2010 | 248 | 273 | 314 | 289 | 292 | 153 | 106 | 111 | 128 | 125 |

a) b) c) d)

Fig. 5. Low-water riverbeds of the Khorol river (a), the Rostavytsia river (b) and its tributary Pavolochka (c), and the Sovka river in Kyiv (d)


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Fig. 6. Low-water riverbed of the Ros river above the confluence with the Skvyra river

In recent decades, under conditions of a significant reduction in run-off, at many reservoirs during the summer–autumn period the requirements for mandatory environmental flows stipulated by operating rules and Article 76 of the WCU are either not met or are implemented only partially. In many cases, bottom outlets are completely silted up, spillway gates are inoperative, hoisting mechanisms have been removed, and spillway shaft openings have been sealed; consequently, outflow to downstream reaches occurs only through overtopping of the shaft walls during periods of intense and prolonged precipitation (Fig. 7). As a result, in river sections between ponds, riverbeds replenishment during low water occurs only through seepage through the dam body and local runoff from the inter-pond area (Fig. 8).

The reduction in run-off resulting from increased evaporation, ploughing and development of the upper parts of small river catchments, road construction without adequate culverts, siltation of riverbeds and water bodies, excessive withdraw of flow for economic purposes, and other anthropogenic factors has led to a sharp shallowing of rivers, resulting in the complete desiccation not only of riverbeds but also of ponds that were still full of water at the end of the previous century (Fig. 9). Their partial and short-term filling occurs only during spring floods or very intense flood events. Due to the absence of flow during low-water periods, delineating the boundaries of WPZ from the low-water level becomes impossible for such water bodies.

As privatisation of lands in river valleys under Ukrainian legislation is permitted only outside the lands of the water fund, in cases where information is absent from the State Land Cadastre and cadastral maps, the classification of parcels of former riverbeds, vanished water bodies, dried-up areas of shallowing (or disappearing) lakes, and the associated WPZ as lands of the water fund becomes a matter of prolonged court disputes. Accordingly, to avoid legal ambiguity in the interpretation of such controversial situations, it is necessary to establish a fixed value of the low water levels for permanent watercourses and reservoirs, as well as to adopt other approaches to establishing the internal boundary of the WPZ for temporary, drying up or disappeared (with the prospect of restoration) water bodies.

The fixed low level can be taken as its average value for the observation period, for the period of the modern climate norm (1990-2020), for recent decades, etc. It is advisable to set the average level value for the period from July to September, when the lowest levels are observed on the most of the rivers.

Fig. 7. Damaged spillway structure and empty spillway shaft at ponds in the riverbed of the Pavolochka river

Fig. 8. Downstream sections of the Kosiv reservoir dam and the pond dam in the village of Shamraivka on the Rostavytsia river

Fig. 9. Dried-up ponds on the Menzheliia river near the village of Vesela Dolyna


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Another option is to take the low water level as the water level in the river with a specifically defined probability of exceeding it (as an option – 90% or 95% of the average annual flow).

The determination of the low-water level at specific cross-sections located away from hydrological gauging stations should be carried out taking into account the river slope along the section between the cross-section and the gauging station. For the rivers where hydrological observations are unavailable, the determination of the long-term average low-water level is possible on the basis of estimating the average annual discharge with a probability corresponding to low-water levels (using observation data from similar rivers), in accordance with the standard methodology for calculations in the absence of hydrometric observations [22], and by means of hydrological calculations to determine water levels using the Chezy–Manning equation together with data obtained from direct hydrometric surveys at the specific cross-sections.

Determining low-water levels using the above-mentioned methodology significantly complicates the process of WPZ boundaries delineation. Therefore, in the absence of direct observations of low-water levels, it is advisable to measure the width of WPZ from the bank crest of rivers and lakes, particularly where the bank slope exceeds 30°. In such a case, Article 1 of the WCU should be amended to include a definition of the term "bank crest" as the line separating a riverbank from its floodplain. For the ponds and reservoirs, it is advisable to adopt, as a fixed low-water reference level, either the normal retention level (NRL) established by the operating rules or the flood retention level (FRL), which is close to the maximum reservoir storage level. For the lakes with gently sloping banks, as well as in cases where the surface area of the water body decreases substantially during the low-water period, the inner boundary of WPZ may be defined as the boundary of aquatic vegetation overgrowing the lake bed.

Article 88 of the WCU states that waterside protection zones are established for rivers regardless of the duration and frequency of their filling. In hydrological practice, the question often arises whether waterside protection zones should be established along temporary or drying rivers. This issue is particularly relevant in mountainous regions of Ukraine, where the riverbeds of low-order tributaries are filled primarily during floods and intense high-water events, as well as in the southern steppe regions, where rivers may dry for the long periods during low-water conditions. According to DSTU 3517:2024, temporary watercourses are those, in which water flow is observed for less than half of the year. This is understandable from a hydrological perspective; however, in legal practice it is necessary to establish a specific period of flow occurrence during the year, averaged over a long-term observation period, since even the largest rivers of the Azov region and Crimea have experienced short periods of complete flow cessation or prolonged periods, during which the river flowed only as a narrow stream occupying a small portion of the riverbed. In the absence of regular hydrological observations on small watercourses, determining whether a watercourse is permanent or temporary is, in many cases, practically impossible. This issue can be addressed through the creation of a unified register (catalogue) of small watercourses within river basins, containing their hydro-morphological characteristics and designated classifications: temporary or permanent stream, watercourse, or small river. The creation of such a catalogue would be advisable on the basis of the State Register of Geographical Names maintained by the State Service of Ukraine for Geodesy, Cartography and Cadastre, in accordance with subparagraph 30 of paragraph 4 of the Regulation on the State Service of Ukraine for Geodesy, Cartography and Cadastre, approved by Resolution No. 15 of the Cabinet of Ministers of Ukraine dated 14 January 2015.

The structure and conciseness of legislative acts do not permit the direct incorporation of the proposed modern methodological approaches to delineating WPZ boundaries into the articles of the Water Code, as these approaches require specific algorithms for hydrological calculations and geodetic measurements. For their practical implementation, it is necessary to develop separate methodological guidelines, adopted at the regulatory level, that would take into account the specific characteristics of river hydrological regimes and riverbeds morphology.

With the entry into force of the Methodology for the Delineation of Surface Water and Groundwater Bodies [9], the provisions of the WFD concerning the determination of lakes types by water surface area were incorporated into Ukrainian legislation. According to this classification, lakes are divided into small lakes with a surface area of 0.5–1 km²; medium-sized lakes with a surface area of 1–10 km²; large lakes with a surface area of 10–100 km²; and very large lakes with a surface area exceeding 100 km². Accordingly, natural closed water bodies with a water surface area of less than 0.5 km² are not taken into account when delineating surface water

bodies. According to the WCU, unlike ponds, all lakes are assigned the same width of WPZ, regardless of their size. This is primarily due to the absence of water exchange in closed water bodies, in contrast to riverine water bodies. The processes of self-purification and self-regulation in such water bodies are significantly slowed and occur mainly due to groundwater inflow. The Water Code does not specify minimum size thresholds for lakes requiring the establishment of waterside protection zones. In such cases, strictly adhering to the requirements of legislation, the WPZ with a width of 100 m, or even 200 m (where slope gradient exceeds 3°), must be established even around very small and shallow natural closed water bodies, commonly referred to as "large puddles". In practice, this leads to restrictions on the economical use of large areas of productive agricultural land. Accordingly, taking into account the above-mentioned lake typology [6,9], in order to delineate the outer boundary of water fund lands, it is advisable to introduce a new category ("type", in accordance with the WFD) – "very small lakes" with a water surface area ranging from 0.005 km² to 0.5 km² (0.5 ha to 5 ha), and to establish the WPZ width of 25 m for them, as for the small rivers. For the small lakes with a water surface area from 0.5 to 1 km², the width of the WPZ should be set at 50 m, while for all other types (medium-sized, large, and very large, according to the Methodology [3]) the WPZ width may remain 100 m, as defined in Article 88 of the WCU.

For water bodies with a water surface area of less than 0.005 km², the establishment of the WPZ is not required, if their depth during the low-water period does not exceed 3 m ("shallow lakes" according to the WFD classification). Similar restrictions should also be introduced for ponds, since according to the definition in Article 1 of the WCU, they include all artificially created water bodies with a capacity not exceeding 1 million m³. Accordingly, under a strict interpretation of this principle, the waterside protection zones would have to be established even around individual swimming pools or water-filled household excavations. Since the width of the WPZ around ponds with an area of less than 3 ha is determined depending on the category of the rivers, on which they are constructed, it is necessary to normatively establish only their minimum area, approximately, as for lakes, at 0.005 km². Smaller water bodies may be classified as basins, if they do not fall under the category of technological water bodies.

Article 3 of the WCU stipulates that the lands of the water fund of Ukraine include artificial water bodies (reservoirs and ponds) and canals, except the canals within irrigation and drainage systems. At the same time, in 2013, following the adoption of the Law of Ukraine 'On Aquaculture', the term "technological water body" was introduced into Article 1 of the WCU. It refers to a water body artificially created for a special technological purpose, defined by a technical project and/or passport, which is filled artificially using hydraulic structures and facilities. Previously, such technological water bodies as irrigation storage reservoirs, settling ponds, fire-fighting basins, cooling basins for energy facilities, and fish-farming water bodies were classified as "ponds" and, accordingly, belonged to the lands of the water fund, and the WPZ had to be established around them in accordance with Article 88 of the WCU. With the introduction of the term "technological water body" into the WCU, the above-mentioned water bodies now form a separate category of water bodies created to serve specific production purposes that differ from ponds by their specific functional designation, which is defined by a technical project or passport. The Water Code does not explicitly state that this category of the water bodies **does not** belong to the lands of the water fund, as is specified for the canals within irrigation and drainage systems. This has led to legal disputes, and in order to resolve them it is necessary to ensure legislative clarity regarding the classification of technological water bodies as part of the water fund. In particular, paragraph 4 of clause 1 of Article 3 of the WCU should specify either that the water fund of Ukraine includes "artificial water bodies (reservoirs, ponds, **technological water bodies**…)" or that it includes "artificial water bodies (reservoirs and ponds), the canals, except the canals within irrigation and drainage systems, **and technological water bodies"**, depending on the adopted regulatory decision. Another option is to designate their inclusion in the water fund within the definition of the term "technological water body" in Article 1 of the WCU itself.

The most part of the existing classifications of the lakes based on their origin includes a category of "quarry-type lakes"; however, according to Article 1 of the WCU, the lakes may be of natural origin only, and therefore quarry-type water bodies are classified as ponds, despite the fact that in terms of their hydrological regime, water exchange, and feeding conditions they are practically indistinguishable from the lakes. Accordingly, the boundaries of WPZ around the quarry-type water bodies, as well as the other artificially created enclosed non-technological


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water bodies, should be defined in the same way as for the lakes.

In accordance with Article 88 of the WCU, along seas and around sea bays and estuaries, a waterside protection zone shall be established with a width of not less than 2 km from the waterline. This article does not mention such a water body as a lagoon (a closed estuary [9]), which, according to the dictionary [4], is an elongated, shallow water body along the coast with saline or brackish water, connected to the sea by one or several channels or separated from it by a sandbar; in other words, it differs from an estuary only in the part that it is not totally open to the sea. Such water bodies include a number of water bodies in the interfluve between the Danube and the Dniester, in particular the Budak Estuary, the Tuzly Estuaries, and others, which are differently referred to in maps and reference sources either as estuaries, lakes, or lagoon-type estuaries (Fig. 10). The WCU does not contain the term "lagoon" or "closed estuary"; therefore, when determining the width of a waterside protection zone, the question arises whether it should be set at 100 m, as for a lake, or at 2 km, as for an estuary.

Article 1 of the WCU defines an estuary as "a river valley or ravine mouth inundated by **sea waters**". From this definition, it follows that this term refers to inundated river-mouth sections only of those rivers that flow into the sea. The term "river estuary" is absent in the regulatory framework, which creates legal uncertainty in judicial practice whether river mouths inundated by water reservoirs should be considered as the part of the river or of the reservoir (e.g., the Teteriv, Stuhna, Sula, Samara rivers, etc.). For example, if the width of the WPZ along the mouth of the Stuhna river is calculated as for a river, it will be 25 m, whereas if it is calculated as for a reservoir, it will be 100 m. The water level regime of such sections is similar to that of reservoirs; in fact, they constitute parts of reservoirs, and therefore the WPZ for them should be determined from the inundation threshold at the normal retention level (NRL) (or flood retention level, FRL) of the reservoir. Accordingly, hydrological terminology should be supplemented with the terms "marine estuary" and "river estuary", and the definition of an estuary in Article 1 of the WCU should be revised as follows: "*a river valley or gully mouth inundated by sea waters, reservoir waters, or pond waters"*. Appropriate amendments should also be introduced to Article 88 of the WCU. For polder-type estuaries (e.g., the Irpin, Trubizh, and Tiasmyn rivers), the width of the WPZ should be determined as for rivers, as their hydrological regime more closely corresponds to that of the river systems.

**Study limitations and prospects for further research.** The limitations of the conducted research lie in the predominant use

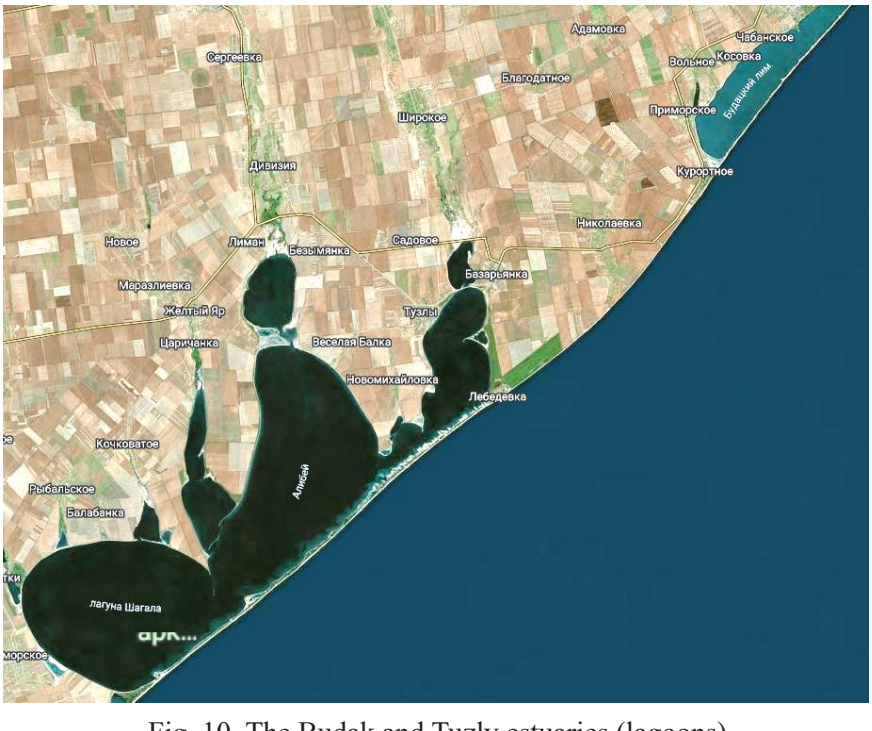


Fig. 10. The Budak and Tuzly estuaries (lagoons)

of an information-analytical method based on the analysis of legal actions and regulatory frameworks, without the involvement of extensive field measurements. The proposed classification approaches require further validation at the regional scale, taking into account the diversity of natural conditions of Ukraine. The future research prospects lie in the development of comprehensive regulatory and methodological guidelines integrating hydrological, geomorphological, and legal aspects, as well as in the creation of a unified database of small watercourses and water bodies to ensure transparency and unambiguous determination of their legal status.

**Conclusions.** The analysis of the provisions of the Water Code of Ukraine has shown that most legal conflicts in the delineation of waterside protection zones are caused by the absence of a clear classification of water bodies and by the ambiguity of terminology. The lack of clear definitions of the terms "river", "stream", "small watercourse", "low water", "slope gradient", "lagoon", and others creates conditions for divergent interpretations in law enforcement and judicial practice.

The necessity of classifying small watercourses with the identification of such categories (types) as "streams", "watercourses", "very small rivers", and "small rivers" has been substantiated. This will allow to introduce a differentiated approach to determining the width of waterside protection zones and to minimise the unjustified withdrawal of land from economical use, while maintaining environmental effectiveness.

One of the key problems is the absence of a unified approach to the determination of the low-water level and the reference point for measuring slope gradient. Due to the difficulties in calculating the variable low-water level, an alternative approach is proposed for determining the width of waterside protection zones from the bank crest or the normal or flood retention level for artificial water bodies.

The need for regulatory clarification of the status of temporary and drying watercourses through the creation of a state register of small watercourses has been identified. The classification of lakes by water surface area has also been substantiated, along with the clarification of the legal status of technological water bodies, quarry-type water bodies, river estuaries, and lagoons.

The implementation of these approaches requires the development of regulatory and methodological guidelines that take into account the hydrological regime, valley morphology, and clear algorithms for geodetic calculations.

**Conflicts of interest**: the authors declare no conflict of interest.

**Use of artificial intelligence**: the authors confirm that they did not use artificial intelligence technologies during the creation of this work.

## References

1. Kozytskyi, O.M., Shevchuk, S.A., & Shevchenko, I.A. (2015). Naukovi osnovy ta normatyvno – pravovi problemy vyznachennia mezh pryberezhnykh zakhysnykh smuh. [Scientific foundations and regulatory and legal problems of determining the boundaries of waterside protection strips]. *Melioratsiia i vodne hospodarstvo*, *102*, 8–14 [in Ukrainian].

2. Verkhovnyi Sud Ukrainy. (2014). Postanova Sudovykh palat u tsyvilnykh ta hospodarskykh spravakh Verkhovnoho Sudu Ukrainy po spravi 6-171tss14v [Resolution of the Judicial Chambers in Civil and Commercial Cases of the Supreme Court of Ukraine for the case 6-171tss14v] [in Ukrainian].

3. DP "UkrNDNTs". (2024). Hidrolohiia sukhodolu. Terminy ta vyznachennia osnovnykh poniat [Land hydrology. Terms and definitions of basic concepts] (DSTU 3517:2024) [in Ukrainian].

4. Vodnyi kodeks Ukrainy [Water Code of Ukraine], Postanova Verkhovnoi Rady Ukrainy No. 14/95-VR (1995) [in Ukrainian].

5. Khilchevskyi, V.K., Hrebin, V.V., & Manukalo, V.O. (2022) Hidrolohichnyi slovnyk. [Hydrological Dictionary]. Kyiv: DIA [in Ukrainian].

6. Derzhavnyi departament z pytan adaptatsii zakonodavstva Ministerstva yustytsii Ukrainy. (2006). EU Water Framework Directive 2000/60/EC. Key terms and definitions [Ofitsiinyi pereklad]. Kyiv [in Ukrainian].

7. Hrebin, V.V., Khilchevskyi, V.K., Babii, P.O., & Zabokrytska, M.R. (2015) Otsinka richkovoi merezhi baseinu Rosi za typolohiieiu richok zghidno Vodnoi ramkovoi dyrektyvy Yevropeiskoho Soiuzu. [Assessment of the river network of the Ros basin by river typology according to the Water Framework Directive of the European Union]. *Hidrolohiia, hidrokhimiia, hidroekolohiia*, *2* (37), 23–33 [in Ukrainian].


ISSN 2616-5562 (Online)
ISSN 2616-5643 (Print)

8. Khilchevsky, V.K., Hrebin, V.V., & Zabokrytska, M.R. (2016). Otsinka hidrohrafichnoi merezhi raionu richkovoho baseinu Visly (zakhidnoho Buhu ta Sanu) na terytorii Ukrainy zghidno typolohii Vodnoi ramkovoi dyrektyvy Yevropeiskoho Soiuzu. [Assessment of the hydrographic network of the Vistula river basin district (western Bug and San) on the territory of Ukraine according to the typology of the Water Framework Directive of the European Union]. *Hidrolohiia, hidrokhimiia, hidroekolohiia*, *1* (40), 32–44 [in Ukrainian].

9. Metodyka vyznachennia masyviv poverkhnevykh ta pidzemnykh vod. [Methodology for determining surface and groundwater bodies]. (2019). Nakaz Ministerstva ekolohii ta pryrodnykh resursiv Ukrainy, 4 [in Ukrainian].

10. Ilin, L. V. (2017). Klasyfikatsii ozer Ukrainskoho Polissia. [Classifications of lakes of Ukrainian Polissya]. *Naukovyi visnyk Skhidnoievropeiskoho natsionalnoho universytetu imeni Lesi Ukrainky. Seriia: Heohrafichni nauky*, *8* (357), 11–19 [in Ukrainian].

11. Ilin, L. V. (2000). Haluzevi klasyfikatsii ozer Polissia. [Sectoral classifications of lakes of Polissya]. *Hidrolohiia, hidrokhimiia i hidroekolohiia*, *1*, 215–220 [in Ukrainian].

12. Khilchevskyi, V.K., & Hrebin, V.V. (2021). Velyki i mali vodoskhovyshcha Ukrainy: rehionalni ta baseinovi osoblyvosti poshyrennia [Large and small reservoirs of Ukraine: regional and basin-specific features of distribution]. *Hidrolohiia, hidrokhimiia i hidroekolohiia*, *2* (60), 6–19 [in Ukrainian].

13. Khilchevskyi, V.K., & Hrebin, V.V. (2020) Suchasna hidrohrafichna kharakterystyka stavkiv v Ukraini – rehionalni i baseinovi aspekty. [Modern hydrographic characteristics of ponds in Ukraine – regional and basin aspects]. *Hidrolohiia, hidrokhimiia i hidroekolohiia*, *3* (58), 20–30 [in Ukrainian].

14. Howard-Williams C., & Vincent W. F. (1984) Optical properties of New Zealand lakes I: attenuation, scattering, and a comparison between downwelling and scalar irradiances. *Arch Hydrobiol*, *19*, 318–330.

15. Renu Bhardwaj, A.K. (2005). Thukral and Upma Narang. Lake Characterization and Classification. In book: Statistical Accounting of Water Resources. Publisher: Ministry of Statistics and Programme Implementation. New Delhi, 1–11.

16. Hrebin, V.V., Khilchevskyi, V.K., Stashuk, V.A., Chunarov, O.V., & Yaroshevych, O.I. (2014). Vodnyi fond Ukrainy. Shtuchni vodoimy. Vodoskhovyshcha i stavky. [Water Fund of Ukraine. Artificial reservoirs. Reservoirs and ponds]. Dovidnyk. Khilchevskoho, V.K., Hrebenia, V.V. (Ed). Kyiv [in Ukrainian].

17. Mokliak, V.I. (1957). Kataloh richok Ukrainy Kyiv. [Catalogue of the rivers of Ukraine]. Mokliak, V.I. (Ed). AN URSR [in Ukrainian].

18. Materyaly po typyzatsyy rek Ukraynskoi SSR: Vol. 2. Hydrohrafycheskye kharakterystyky rek Ukraynskoi SSR [Materials on typification of rivers of the Ukrainian SSR: Vol. 2. Hydrographical characteristics of rivers of the Ukrainian SSR]. (1953). Kyev: Izdatelstvo AN USSR.

19. Resursy poverkhnostnykh vod SSSR: Vol. 6. Hydrolohycheskaia yzuchennost [Surface water resources of the USSR: Vol. 6. Hydrological study] (Issues 1–3). (1964). Leningrad: Hydrometeoyzdat [in Russian].

20. Bairak, H.R. (2018). Metody heomorfolohichnykh doslidzhen. [Methods of geomorphological research]. Bairak H.R. (Ed). Navch. Posibnyk. Lviv: LNU im. I. Franka [in Ukrainian].

21. Pokydko, I., & Martyn, A. (2012). Nova kontseptsiia formuvannia vodookhoronnykh obmezhen u vykorystanni zemel. [A new concept for forming water protection restrictions in land use] Zemlevporiadnyi visnyk, 7, 34-40 [in Ukrainian].

22. Vyznachennia rozrakhunkovykh hidrolohichnykh kharakterystyk. [Determination of design hydrological characteristics]. (1985). SNyP 2.01.14–83 Hidroproekt. BST, 6 [in Ukrainian].

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# АКТУАЛЬНІ ПИТАННЯ ГІДРОЛОГІЧНОЇ ТЕРМІНОЛОГІЇ ТА КЛАСИФІКАЦІЇ ВОДНИХ ОБ'ЄКТІВ У КОНТЕКСТІ ВОДНОГО ЗАКОНОДАВСТВА УКРАЇНИ

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***Анотація.*** *У результаті аналізу юридичних проблем, які виникають при реалізації положень Водного кодексу України щодо забезпечення природоохоронного режиму на землях водного фонду встановлено, що вони значною мірою зумовлені неоднозначністю трактування гідрологічної термінології та відсутністю нормативних визначень окремих гідрологічних термінів, що використані або не наведені у Водному кодексі, зокрема, таких понять як річка, потічок, струмок, межень, крутизна схилу, лагуна, річковий лиман тощо. Використання лінійного принципу при визначенні зовнішньої межі прибережних захисних смуг вимагає встановлення фіксованих значень точок відліку їх ширини та крутизни схилу, тоді як меженний рівень, що згідно з Водним кодексом є внутрішньою межею прибережних захисних смуг, не має постійного значення і може значно змінюватися як у різні роки, так і протягом одної межені. Крім того, встановлення його середнього багаторічного значення за відсутності тривалих спостережень на річках є практично неможливим. Оскільки положення Водного кодексу є імперативними нормами, для недопущення їх різнобічного трактування в статті запропоновані новітні методичні підходи щодо встановлення меж прибережних захисних смуг з урахуванням гідроморфологічних умов річкової долини. Іншою причиною юридичних проблем при встановленні меж прибережних захисних смуг є відсутність у Водному кодексі класифікації природних і штучних водойм, зокрема, нижньої граничної межі площі водозбору малих річок, а також площі чи глибини озер і ставків. На основі виконаних досліджень запропоновано доповнення до класифікації річок, що наведена у Водному кодексі, а також класифікація озер за площею водного дзеркала, що забезпечить диференційований підхід до визначення ширини прибережних захисних смуг окремих категорій малих водотоків і водойм. Внесено пропозиції щодо змін і доповнень до глосарію гідрологічної термінології, що наведений у Водному кодексі України. Для практичної реалізації нових методологічних підходів до визначення меж прибережних захисних смуг запропоновано розробити окремі нормативно-методичні рекомендацій, які враховували б особливості гідрологічного режиму річки і морфології русел.*

***Ключові слова:*** *річка, водойма, озеро, ставок, межень, лагуна, прибережна захисна смуга, Водний кодекс, законодавство*


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